

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

SKYLINE SOFTWARE SYSTEMS, INC.,

Plaintiff,

v.

KEYHOLE, INC., and
GOOGLE INC.

Defendants.

CIVIL ACTION NOS. 04-11129 DPW &
06-10980 DPW

**DECLARATION OF PROFESSOR STEVEN K. FEINER, PH.D. IN SUPPORT OF
DEFENDANTS' OPENING CLAIM CONSTRUCTION BRIEF**

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I, Steven K. Feiner, declare as follows:

1. I know the following information through my own personal knowledge, unless otherwise stated, and if called and sworn as a witness, I could and would competently testify thereto.

2. I make this declaration in support of the Opening Claim Construction Brief filed by Keyhole, Inc. and Google Inc. (collectively "Google" or "Defendants") regarding claims other than claims 1 and 12 of U.S. Patent No. 6,496,189 ("the '189 patent"), and provide my opinion as to what the claims of the '189 patent mean to one of ordinary skill in the art.

3. My qualifications are stated more fully in my *curriculum vitae*, a true and correct copy of which is attached as Exhibit A. I provide a brief summary of my relevant qualifications below.

4. I received a Ph.D. in Computer Science from Brown University in 1987. I received an A.B. degree in music from Brown University in 1973.

5. I am presently a Professor of Computer Science at Columbia University, a position that I have held for twenty years. I have been a Full Professor since January 2000. Prior to that, I was an Associate Professor of Computer Science at Columbia University from January 1991 until December 1999, and an Assistant Professor from September 1985 to December 1990. Prior to joining the faculty of Columbia University in September 1985, I was a Research and Teaching Assistant in the Department of Computer Science at Brown University from September 1977 until August 1985.

6. At Columbia University, I direct the Columbia University Computer Graphics and User Interfaces Library, and teach both graduate and undergraduate students in computer graphics and user interfaces courses. I advise Computer Science doctoral candidates, primarily in the field of computer graphics and user interfaces. I am an active academic researcher, whose areas of research include knowledge-based design of graphics and multimedia, user interfaces, virtual reality and augmented reality, wearable computing, animation, hypermedia, and visualization.

7. I am coauthor of *Computer Graphics: Principles and Practice, Second Edition*, Addison-Wesley, 1990 (“*Computer Graphics*”), an authoritative and frequently cited academic computer graphics text. I am also a coauthor of *Introduction to Computer Graphics*, Addison-Wesley, 1993, and *Computer Graphics: Principle and Practice, Second Edition in C*, Addison-Wesley, 1996. As indicated on my *curriculum vitae*, I am the author and coauthor of over twenty journal papers, over seventy conference papers, and numerous other workshop papers, books and book chapters, editorials and other publications on computer graphics and user interfaces. I have been an Associate Editor of *ACM Transactions on Graphics* and *ACM Transactions on Information Systems*, and have been on the editorial boards of *IEEE Transactions on Visualization and Computer Graphics*, and *Virtual Reality*. I am a frequent invited speaker on computer graphics and user interfaces at institutions such as Princeton University, the Massachusetts Institute of Technology, and Carnegie Mellon University. In addition, I have given invited talks at numerous conferences and workshops, including ones related to Geographic Information Systems (“GIS”), such as *GIScience 2002*, the Advanced Research and Development Activity *Geospatial Intelligence Information Visualization Researchers Meeting 2003* and *GIS Planet 2005*. In 1991, I received an Office of Naval Research Young Investigator Award.

8. I am a named inventor on an issued United States patent relating to computer graphics, entitled “Worlds-within-worlds nested display and interaction system and method” (U.S. Pat. No. 5,524,187).

9. I have previously submitted declarations in this case in support of Google’s responsive claim construction brief and in support of Google’s opposition to Skyline’s motion for preliminary injunction. I hereby incorporate the opinions stated in those declarations by reference.

10. I have reviewed the ’189 patent and its relevant prosecution history and am familiar with this patent, its claims, and the background technology.

11. I understand that patent claims should be construed from the perspective of a

person of ordinary skill in the relevant art at the time the patent application was filed. In my opinion, the relevant art for the '189 patent is computer graphics. The '189 patent uses concepts, nomenclature, designs, and systems from the computer graphics art that should be understood in this context. In my opinion, one of ordinary skill in the art relevant to the subject matter of the '189 patent at the time the application for the patent was filed would be a person with a bachelor's degree in Computer Science, including at least one course in computer graphics, or with work experience equivalent to that level of education.

12. In construing the claims of the '189 patent, I considered the '189 patent and its prosecution history from the point of view of one of ordinary skill in the relevant art. I did not read the claims in light of any specific software product accused of infringing or practicing the '189 patent.

CONSTRUCTION OF '189 PATENT TERMS IN DISPUTE

13. The '189 patent, entitled "Remote Landscape Display and Pilot Training," relates generally to terrain displays and specifically to computer display of real-life three-dimensional images of terrain. *See* '189 patent at col. 1:11-13.

14. I understand that Skyline has accused Defendants of infringing each and every one of the 24 claims of the '189 patent. I also understand that, in response to interrogatories, Skyline has identified only claims 1-3, 7-9, 11-14, 16, 18-19, and 21-24 as asserted claims in this lawsuit. The Court's March 24, 2006 Memorandum and Order re claim construction addressed the proper construction of terms in claims 1 and 12 of the '189 patent. In this declaration, I provide my opinion as to how one of ordinary skill in the art would understand the disputed terms in claims 2-3, 7-9, 11, 13-14, 16, 18-19, and 21-24. Additionally, in my opinion, the disputed terms are used consistently throughout the claims and should therefore be given the same construction throughout the claims.

"downloading"

15. I understand that the parties disagree as to the proper construction of the term "downloading" as it is used in the '189 patent claims. In my opinion, a person of ordinary skill

in the art at the time of the '189 patent invention would understand "downloading" in the context of the patent to mean "requesting over a network and receiving in local memory from a separate computer."

16. According to the '189 patent specification, the download of a data block from a remote server is not completed until it is received by the local computer and can be provided to the '189 patent renderer. For example, the specification explains "[w]hen cache manager **74** finishes downloading an additional block of a higher resolution level from server **26**, the block is provided to renderer **72**, which updates the rendered view accordingly." *Id.* at col. 12:66-13:2. In fact, the specification goes on to explain that "[a]s the blocks are *received from* the server, they are supplied to renderer **72[.]**" *Id.* at col. 14:44-46 (italics added). The specification also states that "cache manager **74** preferably always requests that server **26** send a block **42** after the cache manager *has received* its parent block." '189 patent at col. 12:5-7 (italics added). Thus, in downloading higher resolution data after lower resolution data, the lower resolution data is not considered "downloaded" until after it has been received in local memory.

17. Thus, the specification makes clear that the "downloading" of a data block has not completed until the data block has been received by the local computer so that the block can be provided to the '189 patent renderer.

18. I understand that Skyline proposes that "downloading" be construed as "transferring from a remote server to a local computer." If Skyline's construction were intended to cover situations in which the data block is requested from or sent by the remote server, but never received by the user's computer, it would not be supported by the '189 patent specification. The '189 patent invention is directed to the display of terrain on the user's computer. '189 patent at col. 1:11-13. If the requested data blocks are never received by the user's computer, the terrain cannot be displayed. Thus, this incorrect understanding of Skyline's construction would lead to an interpretation of the patent claims that falls outside the stated scope of the invention.

“receiving from the renderer” and “providing the renderer”

19. The ’189 patent claims require “receiving from the renderer” coordinates and a respective resolution level. In addition, they also require “providing the renderer” with a first data block corresponding to the coordinates received from the renderer from a local memory. *E.g.*, ’189 patent, claim 1 at 16:32-38, claim 3 at col. 16:55-61, claim 7 at col. 17:46-51, claim 12 at col. 18:21-26, claim 13 at col. 18:41-45, and claim 18 at col. 20:14-18. One of ordinary skill in the art would understand “receiving from the renderer” to mean that “an object other than the renderer receiving from the renderer.” “Providing the renderer” should be construed to mean “an object other than the renderer providing the renderer.”

20. I have reviewed the Court’s March 24, 2006 Memorandum and Order (“Claim Construction Order”) construing disputed terms in claims 1 and 12 of the ’189 patent. The Claim Construction Order recognizes that the ’189 patent renderer provides coordinates and a resolution level to another object. *See* Claim Construction Order at 26-32. The Court construed “renderer” as a “software and/or hardware object that performs at least the following functions: (1) determining and providing to another object the required coordinates in the terrain along with a respective resolution level; (2) receiving the data blocks corresponding to the specified coordinates; and (3) using the received data blocks to display a three-dimensional image.” *Id.* at 32.

21. The ’189 patent specification states “[r]enderer **72** determines the coordinates of the pixels it needs in order to render the view and requests the descriptions of these pixels from a cache manager **7472** determines the exact blocks needed and calls for them using their (x,y) coordinates and their resolution level **44**. Alternatively or additionally, renderer **72** specifies, for each resolution level **44**, the coordinates of the boundaries of the necessary areas, and cache manager **74** determines the identities of the required blocks **42Id. at col. 14:10-16. Thus, the specification makes clear that the ’189 patent renderer provides coordinates and a resolution level to another object. The Court recognized this in its Claim Construction Order. *See* Claim**

Construction Order at 29, 31. In any embodiment of the invention, the renderer specifies to *another object* what coordinates are required, along with identifying the respective resolution level. *See id.* at 32.

22. The specification likewise makes clear that it is another object that provides the renderer with a first data block from local memory. The specification explains that “[t]he rendering program orders the blocks it needs using a cache manager, which is preferably a software routine running on the processor. If the cache manager has the ordered block, it provides it to the rendering program.” ’189 patent at col. 3:58-61; *see also* Claim Construction Order at 27-28.

“downloading . . . if the provided block from the local memory is not at the indicated resolution level” and “downloads . . . if the first block is not from the indicated level”

23. This phrase would be understood by one of ordinary skill in the art to mean “downloading . . . based upon a determination of whether the first data block already in the local memory is not of the indicated resolution level (detail per unit area).”

24. The claim language is clear that a determination that the first data block from the local memory is not at the correct resolution level must be made before downloading additional data blocks. The claims recite the downloading step as conditional, occurring only “if the provided block from the local memory is not at the indicated resolution level.” *See* ’189 patent at cols. 16:39-44 (claim 1), 16:62-66 (claim 3), 17:53-57 (claim 7), 18:46-51 (claim 13), 18:66-19:3 (claim 14), 19:41-45 (claim 16), and 20:19-21 (claim 18).

25. Because the invention relates to the computer display of three-dimensional terrain, the claim language should be considered in the context of a computer program. When an action is conditional, a computer program must make a determination as to whether the specified condition is met in order to take appropriate action. A construction that eliminates this determination would effectively read out the entire phrase “if the provided block from the local memory is not at the indicated resolution level” and dramatically alter the meaning of the claim

by making the downloading step *unconditional*.

26. This construction is also supported by the specification. For example, “[i]f the cache manager has the ordered block, it provides it to the rendering program. However, *if the block is not carried by the cache manager, it is ordered from the server*, and a replacement block from a lower resolution level is passed to the rendering program.” ’189 patent at col. 3:60-64 (emphasis added). As a further example, “[c]ache manager **74** downloads from server **26** the blocks **42** and/or sub-blocks **43** required by renderer **72**, *if they are not already stored in cache memory.*” *Id.* at col. 11:62-64 (italics added). The specification goes on to state that “[w]hen a request for block **150**, identified as ‘x,’ and having resolution level N is received from renderer **72**, cache manager **74** determines... the level j of the highest resolution-level ancestor of block x stored in cache memory **32**. If the block **42** itself is stored in cache memory **32** (*i.e.*, j=N), the block is provided to renderer **72**. Otherwise, the highest resolution level ancestor **152** of block x which is stored in cache memory **32** is provided to renderer **72**.” *Id.* at col. 14:31-39 (italics added). The specification further explains “[i]f block x itself was not found in memory **32**, cache manager **74** adds to a download queue the block x and all its ancestors **158** of resolution levels higher than level j.” *Id.* at col. 14:65-67 (italics added). Accordingly, in all of these examples, the computer must make a determination as to the truth of the conditional before taking appropriate action.

“from a succession of resolution levels”

27. Claim 2 of the ’189 patent depends from independent claim 1, and further requires that the data blocks downloaded from the remote server are downloaded “*from a succession of resolution levels.*” ’189 patent at col. 16:47. Read in the context of the ’189 patent, this phrase is properly construed as “*in order of increasing resolution level.*”

28. This understanding of the term is further supported by the ’189 patent specification, which describes embodiments in which higher resolution data blocks always are downloaded after receiving lower resolution data blocks. See ’189 patent at col. 12:5-7 (“cache manager **74** preferably always requests that server **26** send a block **42** after the cache manager

has received its parent block”). In particular, the specification explains that “cache manager **74** downloads the rest of the ancestors **158** of block x from server **26** *in order of increasing resolution levels.*” *Id.* at col. 14:40-42 (italics added).

29. In addition, during prosecution of the application that issued as the ‘189 patent, the applicants strongly emphasized that the cited prior art, unlike claim 2 (which was originally drafted as claim 4 in the ’189 patent application), did not disclose “a downloading order based on resolution levels.” Chang Decl., Ex. B at 3. The applicants’ statement establishes that “from a succession of resolution levels” refers to downloading data blocks “in order of increasing resolution level.”

“when not downloading blocks required by the renderer”

30. Method claim 7 and apparatus claim 18 (and the claims that depend from them) further require “downloading from a remote server excess blocks not currently needed by the renderer to fill up the local memory *when not downloading blocks required by the renderer.*” E.g., ’189 patent, claim 7 at col. 17:58-61, and claim 18 at col. 20:22-24. The “***when not downloading blocks required by the renderer***” phrase is properly construed as “***during periods of time when the local computer is not downloading data blocks describing three-dimensional terrain in response to the coordinates received from the renderer.***”

31. The specification explains that when downloading data blocks required by the renderer, “cache manager **74** adds to a download queue the [required block] and all its ancestors **158** of resolution levels higher than [the level of the first block from local memory].” ’189 patent at cols. 14:65-67. The “cache manager **74** maintains a list of blocks for which download orders were sent, and therefore are *needed by renderer 72.*” *Id.* at col. 15:39-41 (italics added). “If renderer **72** needs the downloaded block (i.e., it was not ordered solely to fill cache memory **32**, as described hereinbelow), it is passed to the renderer.” *Id.* at col. 15:47-49. “If the download queue is not empty, a block from the queue is downloaded.” *Id.* at col. 15:60-61. The specification thus explains that data blocks required by the renderer are added to a download queue in response to receiving coordinates and a resolution level from the renderer.

32. The downloading of excess data blocks as claimed in claim 7 and its dependent claims is also described in the specification, which states that “*if the queue is empty*, cache manager **74** fills cache memory **32** with the blocks within the range of the current viewpoint.” *Id.* at col. 15:63-65 (italics added). Thus, when the local computer is not downloading data blocks in response to the coordinates provided by the renderer (*i.e.*, when the download queue is empty), that is when the local computer downloads excess data blocks to fill up the local memory.

33. I understand that Skyline proposes “when not downloading blocks required by the renderer” be construed as “when not downloading data for the display of the current view.” However, claim 1 of the ’189 patent already contemplates downloading data not needed for the current view. ’189 patent at col. 16:39-44. Claim 1 is clearly broad enough to encompass downloading data blocks at a resolution level higher than the indicated resolution level (*i.e.*, data not needed for the current view), as its dependent claim 2 is limited to downloading data blocks not above the indicated resolution level. *Id.* at col. 16:45-50. Under Skyline’s proposed construction, claim 1 would also cover “downloading excess data blocks . . . when not downloading blocks required by the renderer,” eliminating much of the difference between claim 1 and claim 7.

34. In addition, even when a data block needed for the current view is downloaded, that data block may also contain additional data that is not needed for the display of the current view. Indeed, the ’189 patent specification recognizes that an entire data block may not be required to display a particular view. ’189 patent at col. 8:29-32 (“Preferably, the blocks are divided into sub-blocks **43** of smaller sizes, such that processors which work with slow modems may download small sub-blocks in case the entire block is not required”). The specification also explains that “[p]referably, each sub-block **43** includes an attachment field in which optional data objects associated with the area covered by the sub-block are described.” *Id.* at col. 8:38-40. Thus, this optional data will be downloaded even if it is not needed for display of the current view. Therefore, construing “when not downloading blocks required by the renderer” as “when

not downloading data for the display of the current view,” as Skyline proposes, would eliminate much of the difference between this limitation of claims 7 and 18 and the claims that depend from them, and the “downloading” claimed in the other claims of the ’189 patent.

“Internet”

35. Claims 8 and 22 of the ’189 patent contain the further limitation that the downloading of data blocks from a remote server be performed via the Internet. ’189 patent, claim 8 at col. 17:62-64, claim 22 at col. 20:37-38. In light of the ’189 patent, one of ordinary skill in the art would understand “Internet” to mean “publicly accessible network of computers capable of relaying information via the TCP/IP communications protocol, either alone or in connection with one or more other protocols.”

36. The specification states that “[p]referably, the processor connects to the server via a communication link, preferably a public network, such as the Internet.” ’189 patent at col. 2:33-35. The specification goes on to state that “[c]onnections **76** are preferably standard TCP connections as are known in the art, although any other protocol may be used to form the connection.” *Id* at col. 12:10-12. Thus, the specification explains that any protocol can be used to establish a communication link, but that in one preferred embodiment, standard TCP connections are used. TCP connections are also referred to as TCP/IP (Transmission Control Protocol/Internet Protocol) connections, and are one of the core Internet Protocols allowing the exchange of data packets between networked machines.

37. I understand Skyline proposes “Internet” be construed as “the publicly accessible world-wide network of that name, which is capable of relaying information via a TCP connection, but not including private networks even if they use internet protocols or have connections to the Internet.” There is no support in the specification for the inclusion of the additional limitation of “but not including private networks even if they use internet protocols or have connections to the Internet,” as private networks can use the TCP/IP communications protocol and can be connected to the publicly accessible Internet.

“substantially all of the blocks surrounding a point in the terrain seen from the current viewpoint within a predetermined distance range”

38. One of ordinary skill in the art would construe the “substantially all of the blocks surrounding a point in the terrain seen from the current viewpoint within a predetermined distance range” phrase in claims 9 and 19 of the ’189 patent to mean “substantially all of the excess data blocks describing three-dimensional terrain on all sides (in all directions) out to a preestablished distance from a point in the terrain that is seen from the current viewpoint.”

39. The specification states that “cache manager **74** attempts to fill cache memory **32** with a sufficient number of blocks, *such that for any view direction* of the current view point, all blocks **42** required by renderer **72** are stored in cache memory **32**.” ’189 patent at col. 12:16-20 (emphasis added). The specification also explains that “cache manager **74** fills cache memory **32** with the blocks within the range of the current viewpoint, *so that, for any direction of view* from the current viewpoint, there is no need to download further blocks from server **26**.” ’189 patent at col. 15:63-65 (emphasis added). Therefore, it is clear that the invention claimed in claims 9 and 19 of the ’189 patent requires the download of excess data blocks in *all* directions.

40. I understand that Skyline proposes the term be construed as “substantially all of the blocks which include data covering terrain which is within a predetermined distance range in one or more directions from either the viewpoint or a point in the terrain visible from the current viewpoint.” Skyline’s proposed construction broadens the claim to cover the download of excess data blocks in “one or more directions” rather than in all directions. Such a construction is at odds with the disclosures in the specification and the plain meaning of the claim language, which clearly requires the download of blocks in *all* directions so that the local memory will have blocks for *any* direction. *E.g.*, ’189 patent at cols. 12:16-20, 15:63-67.

I declare under the penalty of perjury under the laws of the United States of America that, to the best of my knowledge, the foregoing is true and correct.

Dated: September 28, 2006



By: _____
Steven K. Feiner, Ph.D.

Certificate of Service

I hereby certify that, on September 29, 2006, I caused a true and accurate copy of the foregoing document to be served upon all counsel of record for each party by complying with this Court's Administrative Procedures for Electronic Case Filing.

By: _____/s/ Carolyn Chang
Carolyn Chang